IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Smith and Clarke
Application No. 10/549,658
Filed: September 16, 2005
Confirmation No. 7658
For: A SPHERICAL BEARING ARRANGEMENT
Examiner: Thomas R. Hannon
Art Unit: 3682
Attorney Reference No. 739-71455-01

COMMISSIONER FOR PATENTS
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DECLARATION UNDER 37 C.F.R. § 1.132

1. I, Tobias Hülsen, have 11 years experience in the field of spherical bearings and would consider myself an expert in this field. I have been employed as Application engineer at NMB-Minebea GmbH, Langen, Germany for 11 years.

2. I have reviewed the disclosure of GB 1,360,515 (Saitamakiki) and herein present my expert analysis and reasoned interpretation of the disclosure.

3. Saitamakiki discloses a ball joint. As shown in Figure 1 and discussed from lines 5 to 72 of page 2 of the document, the bearing arrangement comprises a spherical ended shaft 6, which appears to be analogous to the ball 4 of the present application. In Saitamakiki, the spherical ended shaft 6 is assembled within a composite construction comprising a bearing housing 9; a two-part bearing block 7; a check ring 12 and various other ancillary items present to ensure that the spherical ended shaft 6 remains within the arrangement of the bearing housing 9. The composite construction formed by these features may collectively be seen as being analogous to the bearing housing 3 of the present application.

4. The composite construction of Saitamakiki is surrounded by an elastic band 8, which

may be seen as being analogous to the annular elastomeric portion 7 of the present application. Finally, the elastic band 8 of Saitamakiki is surrounded by a shell 10, which may be seen as being analogous to the outer race 5 of the present application. Finally, Saitamakiki discloses (on line 61 to 62 of page 2) that the "shell 10 is press-fitted" into a boss of a torque rod 11. This press fit arrangement may be seen as being analogous to the interference fit of the present application.

5. I have carefully analyzed the disclosure of Saitamakiki to determine whether there would, in practice, be any torque between the spherical ended shaft 6 and the composite construction (*e.g.* bearing housing 9, bearing block 7, check ring 12, etc) of the arrangement. Based on my experience of dealing with such bearings as that shown in Saitamakiki, it is my firm opinion that the bearing arrangement shown in Saitamakiki has a zero (*i.e.* no) torque between the spherical ended shaft 6 and the composite construction, for the reasons submitted below.

6. The method of assembly of the bearing arrangement is disclosed on lines 29 to 62 of page 2 of Saitamakiki. Having considered this passage in detail, it is my opinion that the assembly starts with the provision of the preformed bearing housing 9. Then, the spherical ended shaft 6 and two-part bearing block 7 are together assembled into the bearing housing 9. The document does not disclose the order in which these parts are assembled, but my learned opinion and experience suggests that the two-part bearing block 7 will be held loosely around the spherical ended shaft 6 before the collective arrangement is inserted into the bearing housing 9.

7. It should be noted that due to the two-part nature of the bearing block 7, it is not physically possible for the bearing block parts 7, either individually or collectively, to impart any torque upon the spherical ended shaft 6 without external forces being exerted on the two-part bearing block 7. It is my opinion that even with the insertion of the two-part bearing block 7 and spherical ended shaft 6 into the housing 9, there will be no forces imposed by the housing on the spherical ended shaft 6 through the two-part bearing block 7. Indeed, it is to be noted

that there is no disclosure in Saitamakiki of the insertion of the two-part bearing block 7 having an "interference fit" when inserted into the housing 9. This is confirmed by the fact that a check ring 12 is required so that the arrangement does not "fall out" of the bearing housing 9 – see lines 35-37 of page 2 of Saitamakiki. Accordingly, it is clear to me that there are no forces imparted on the two-part bearing block 7 and spherical ended shaft 6 by the housing 9, else there would be no need for a check ring to retain the articles therein.

8. It is my learned opinion that there is a zero torque between the spherical ended shaft 6 and the composite construction of the arrangement shown in Saitamakiki.

9. As an expert in the field, I am well aware of the fact that liquid lubricant cannot be used in a bearing when a high torque is also required – they are incompatible features. This is because to use lubricant will require a gap between the bearing surfaces, which gap causes zero torque. It should be appreciated that even the provision of lubricant at a very high pressure within the arrangement would not, itself, impart a sufficient force upon the ball to create a noticeable, non-zero, torque.

10. These issues were well appreciated by the inventors of the present invention and it was acknowledged that liquid lubricant could not be used because the bearing of the present invention requires, and provides, a non-zero torque (as defined in claim 1). Wear of the bearing surfaces is an accepted disadvantage in order to achieve an advantageous non-zero torque. In one embodiment of the present invention (as defined in claim 6 as pending) there is a self-lubricating liner between the ball and the inner race. Such a self-lubricating liner reduces wear of the bearing surfaces but there is still no gap between the ball and inner race, and therefore the bearing arrangement can still provide a non-zero torque between the ball and the housing.

11. Further, in a method of manufacturing an embodiment of the present invention, the non-zero torque is imparted between the ball and inner race of the housing by the use of a method of swaging. The beneficial effect of swaging is that the inner race is deformed around the ball to

such an extent that, after swaging, there is a residual force imparted by the inner race on the ball, thereby providing a permanent and non-zero torque between the inner race and the ball.

12. I see no reason why the skilled person would seek to adapt the arrangement of Saitamakiki to provide a bearing which has a "non-zero" torque. This is because Saitamakiki discloses a bearing arrangement which cannot simply be adapted so as to provide a non-zero torque between the spherical ended shaft and composite construction. Moreover, Saitamakiki requires the use of lubricant, which as is well known in the field, is not applicable to bearing arrangements having a non-zero torque.

13. I declare that the above statements made on personal knowledge are true, that all statements made on information and belief are believed to be true, and that the above statements are made with the knowledge that willful, false statements or the like is punishable by fine, imprisonment, or both under 18 U.S.C. § 1001 and may jeopardize the validity of the application or any patent issuing thereon.

T. Hülse
Tobias Hülsen

30. June 2008
Date